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From the SCS Chief

Helping Small Family Farm and Ranch Operators Conserve Soil and Water

The Soil Conservation Service is responsible for carrying out a national program of soil and water conservation. A major part of this program is working through conservation districts to help farmers and ranchers plan and apply conservation practices on their land—regardless of the size of or the income from the operation.

SCS works with farmers and ranchers, large and small, who are ready, willing, and able to apply a conservation system. Many of the low-income operators have soil erosion problems but very little extra money to apply the conservation measures that are needed. As a result, during the past several years, SCS has helped additional low-income farmers and ranchers conserve soil and water through the States' targeting of technical assistance.

Many low-income and limited resource farm operators have installed complete conservation systems with financial assistance provided by the Agricultural Stabilization and Conservation Service (ASCS) through the Agricultural Conservation Program. Cost-share funds have also been made available by State and local governments. In addition to the technical assistance it provides, SCS has provided financial assistance for land treatment through its small watershed and Resource Conservation & Development programs.

As part of a departmentwide effort to further improve the delivery of services to small family farmers and ranchers, SCS sponsored a joint seminar with the predominately black, agricultural Land Grant Institutions and Tuskegee University at North Carolina A&T State University in March.

The predominately black Land Grant Institutions are an important source of agricultural research, education, and extension information for low-income and minority farmers of the rural South. SCS and the predominately black institutions are working together to determine the kinds of research that will best meet the production and conservation needs of small family farm and ranch operators. They need low-cost conservation systems that provide multiple benefits.

Well-planned cooperation among SCS, the predominately black Land Grant Institutions and Tuskegee University, the Cooperative Extension Service, ASCS, and State and local governments can provide the kinds of information and assistance that small family farm and ranch operators need.

Cover: Cotton rows on the contour, Tate County, Miss. (Photo by Tim McCabe, former photographer, SCS, Washington, DC.)

Richard E. Lyng
Secretary of Agriculture

Wilson Scaling, Chief
Soil Conservation Service

All programs of the U.S. Department of Agriculture are available to everyone without regard to race, color, national origin, sex, age, or handicap.

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Who Uses No-Till, Who Doesn't, and Why

Economics may play a larger role than conservation in farmers' decisions on whether to use no-till.

A new study has found that users and nonusers of no-till are equally concerned about conservation. Where they differ is in their perceptions of the economic costs and benefits of no-till.

The study was based on interviews with 200 farmers in the Palouse area of Washington and Oregon by rural sociologists at Washington State University and the University of Idaho. It compared the overall characteristics of farmers who have adopted no-till with those of farmers who have never used no-till.

"It would be a mistake for promoters of no-till to assume that this practice is being accepted by farmers mostly because of its conservation implications," the researchers concluded in results released last November. "Early users of no-till in the Palouse reported using it more for its economic appeal than because of a conservation ethic."

Early adopters of no-till, the study found, see the practice as a way of farming their land more efficiently. They are more likely than nonusers to believe that no-till will result in more net income per acre than conventional tillage.

Nonusers, on the other hand, said they will use no-till if the practice is found to reduce their use of fuel and farm labor, and if it will enable them to obtain crops every year. (Rotating a year of crops with a year of fallow is a common practice in the area.) They felt that more herbicides, fertilizers, and insecticides would be needed with no-till.

Those uncertain about whether they will ever adopt no-till cite equipment costs as one reason for being undecided. Weed control is another. The need for better weed control is a major reason for those who do not plan to adopt no-till.

The study found that basic attitudes about conservation do not differ significantly between farmers who use no-till and farmers who don't. Both groups are knowledgeable about the need for conservation and the kinds of practices that are appropriate to prevent soil erosion. Both have had frequent opportunities to obtain information about no-till and to see it being used on nearby farms. Users, however, perceive the indirect impacts of erosion such as downstream siltation and siltation of roadside ditches, as well as long-run production and profit decreases, as more serious problems than do nonusers.

A significant relationship was found between the yields of no-till farmers and the number of years they have been using the practice. Those who have practiced no-till the longest reported higher yields.

Interestingly, almost 70 percent of the users feel their no-till experience has been "very successful" even though their yields have been the same or less than with conventional tillage. This led the researchers to conclude that the economic optimism of the users is based on more factors than just yields. "Farmers appear to be willing to accept lower yields," the researchers wrote, "during the trial period of a new practice."

Early users, the researchers found, are much more likely to have obtained information about no-till from sources outside the Palouse area—either by traveling to see a demonstration or by making long-distance telephone calls. Their most influential sources of information are—in descending order—the Soil Conservation Service, other farmers in the area, farm magazines, chemical dealers, conferences or seminars, and tours of no-till fields.

Nonusers are influenced most by other farmers. They are more likely to be influenced positively about no-till by farm product shows, the local office of the Cooperative Extension Service, and the local land grant university.

Consistent with the findings of earlier research, the study found that users of no-till in the Palouse tend to have higher education levels, higher gross farm incomes, and larger farms than nonusers. The users also farm more rented land and are more likely to be members of a family farm corporation.

The study was funded by the Soil and Water Resources Conservation Act of 1977 (RCA). The principal investigators were Professors Don Dillman of Washington State University and John Carlson of the University of Idaho.

Barbara Osgood,
national sociologist, SCS, Washington, DC

Maine Farmers Respond to No-Till Challenge

"Challenged" by the State legislature, farmers in Franklin County, Maine, are increasing their use of no-till farming.

Franklin County was one of the first counties to participate in Maine's new Challenge Grant Program. This program, enacted by the legislature in 1983, provides funds for innovative conservation practices by soil and water conservation districts. In Franklin County, it provided funds for a cooperative project to increase the use of no-till.

Before the project, less than 2 percent of the corn acreage in Franklin County was in no-till. In 1984, the first crop year in the project, 15 farmers adopted no-till and tripled the acreage in no-till.

Funding for the project came as a challenge grant of $5,755 to the Franklin County Soil and Water Conservation District. The district then persuaded a local implement dealer to purchase a no-till planter and lease it to the district for use by participating farmers. Lack of a commercially available no-till planter had been a major obstacle to the adoption of no-till in the county. The district also hired a tractor and operator to ensure that the no-till planting was accurate and consistent.

Each no-till plot was compared with adjacent conventionally tilled fields, and the participating farmers responded to questionnaires about their experiences with the practice. The farmers and district personnel were also able to exchange information on progress of the project at an off-season dinner meeting. This information is used to help other farmers in the county to make decisions about no-till.

The following year, 1985, funds were received to study the effects of insecticides

on no-till. This study involved comparison plots in the fields of six farmers.

"The no-till system is important to this part of Maine agriculture because it reduces the amount of erosion taking place on river bottom land subjected to heavy spring flooding," said L. H. York, a dairy and crop farmer and immediate past president of the Maine Association of Conservation Districts. A no-till demonstration plot on York's farm is well marked for motorists traveling along U.S. 2, a major east-west highway across northern New England.

"One of the most important aspects of the project," York said, "was that it showed the conservation district could bring together many resources and channel them into a project that applies sound conservation to the land."

The project was a cooperative effort by the farmers, the conservation district, and State and Federal agencies. The district formulated the original proposal for the project, enlisted farmers to take part, and coordinated input from State and Federal agencies. Maine's Soil and Water Conservation Commission, which administers the Challenge Grant Program, approved the project and awarded the grant. The Soil Conservation Service assisted farmers in selecting fields and monitoring the planting operations. The Agricultural Stabilization and Conservation Service provided cost-sharing funds for insecticides and herbicides, which were applied according to recommendations of the Cooperative Extension Service.

Robert A. Halbohm,
district conservationist, SCS, Farmington, Maine

Farmer Is Key to No-Till Success

A Montana farmer says success with reduced tillage and no-till depends on the farmer—not the farm.

Les Auer has about 4,800 acres of nonirrigated cropland near Broadview. He grows wheat, barley, and oats.

When Auer first experimented with reduced tillage on 100 acres of his farm a few years ago, he obtained 6 bushels per acre more on those acres than on the rest of his farm, which was under conventional tillage. The next year Auer put about half of his farm in reduced tillage. This time he got 5 bushels per acre more than from his conventionally tilled crops.

In 1985, Auer no-till seeded more than 200 acres and used reduced tillage on the rest of his farm. And because of low moisture conditions over the past 2 years, he's considering putting his entire operation into no-till for 1986, several years ahead of his own schedule.

Reduced tillage has worked well for Auer. His records show a net savings, or increase in profits, of $25 per acre by switching from conventional to reduced tillage. The savings include a decrease in hours on his tractor from 800 per year for conventional tillage to 280 per year for reduced tillage. This not only saves fuel but also reduces maintenance costs and extends the life of equipment.

His reduced tillage system includes one chemical treatment and one tillage operation. He applies chemicals in early spring to control cheatgrass, goatgrass, and bindweed. His one tillage operation with sweeps and rod weeder is performed when soil conditions are right. This operation is primarily to prepare a seedbed but also cleans up the weeds that come after the chemical application.

With no-till, Auer sprays so that the weeds are hit when they are headed out but before they set seed. With reduced till, he sprays earlier—but at lower rates—to hit the weeds when they are no taller than the length of his index finger. The weeds are easy to control then.

Before his experience of the past few years, Auer used to say no-till would never work on his clayey soils. Now he is convinced that no-till will cut his expenses even more and maybe even increase his yields in some years. He readily admits, however, that both reduced till and no-till require more management. Timing chemical applications, for example, is essential.

Although any mistakes would cut into the $25 per acre savings, the economics still dictate a change toward tilling the ground less. Auer sums it up as trying to "save moisture and convert it into bushels while cutting expenses."

Farmers who are considering reduced till or no-till, according to Auer, should get reliable information from neighbors, USDA's Soil Conservation Service and Extension Service, and various publications. Auer himself has entered into a long-term agreement with USDA's Agricultural Stabilization and Conservation Service, under which he receives some cost-sharing assistance for trying no-till.

Auer, who is a member of the board of directors of the Montana Grain Growers Association, encourages farmers to experiment—on a small scale—to see what works best for them. He is planning several comparison plots to test the effect of no-till's cooler and moister soil conditions on early seedling emergence and vigor in spring.

"It's not that no-till won't work on some farms," says Auer. "It might not work for some farmers. You have to try it to find out."

Larry Robertson,
soil conservationist, SCS, Billings, Mont.

Rain Simulator Built for Display

Rain simulators are usually built for research purposes, but they can be equally effective for demonstrating soil erosion to the public. That's proving to be the case in Iowa, where USDA's Agricultural Research Service (ARS) has built a rain simulator specifically for public display.

ARS built the new simulator after the Iowa Department of Soil Conservation and the Soil Conservation Service requested one for the 1985 Iowa State Fair. "We had a small simulator that had been used a few times for demonstration purposes," said John Laflen, an agricultural engineer with ARS in Ames, Iowa, "but it was designed for outdoor use and wasn't suited for use indoors—so we decided to build one."

Laflen turned the design and construction over to three undergraduates who are research assistants with ARS. The students—Brian Kruse, Jeff Coon, and Art Kalmes—are agricultural engineering majors at Iowa State University. They began in mid-June to design the simulator and had it ready to use by early August.

"I'd estimate we had 500 hours in designing and building it," Kruse said. "We had to build, test, and rebuild. Of course, now that design and testing are complete, the whole display could be built in about 40 hours. The toughest part was to get even rain distribution and still keep the rain from splattering on the floor at an inside event."

Like most simulators, this one duplicates the effect of rainfall by spraying water droplets the size and speed of falling raindrops onto small plots of soil. The intensity of the "rainfall" can be adjusted from 0 to 12 inches per hour.

"We have side-by-side plots of bare soil, soil with cornstalks, and soil with grass cover. There are noticeable differences in the splash effect and amount of soil running off the three," Kalmes said.

After helping to demonstrate the simulator at the 10-day fair, Kalmes is convinced the display is an effective means of demonstrating the erosive action of rainfall. He said fairgoers were attracted to the simulator by the spraying water that regularly sweeps across the plots.

"Most parents explained what was happening to their children, and they did a good job of it. It seems that most people understand soil erosion, and they've heard we're losing topsoil. But they don't often get to see the erosion process and see the difference in erosion from bare soil compared to soil protected with grass or cornstalks. Having it all in a compact unit helps bring home just how important ground cover is for soil conservation," Kalmes said.

For easy viewing, the display catches in quart jars the different amounts of soil eroded from each plot. A clear plastic panel in front of the plots shows that much more soil splashes from the bare soil than from the other plots.

The simulator works best if it's hooked up to running water, but water can also be pumped from a pond or lake. Most of the water is recirculated within the simulator.

"We use a hose to bring water to a small reservoir, and pump it from there through two sprayer nozzles about 9 feet above the ground. The water comes out of the rotating nozzles and sweeps across the plots below," Kruse said.

The simulator uses two electrical sump pumps—one to pump water from the reservoir to the spraying nozzles above the plots and one to pump excess water out of a catch tank below. An electronic timer that controls the frequency of sweeps is used to set the "rainfall" intensity. One sweep of "rain" across the plots every 5 seconds is equivalent to 3 inches of rainfall an hour.

The water tank was made from sheet metal, and the frame was made of aluminum conduit. With new pumps, timer, and paint, the cost of materials was about $1,800.

"We're extremely pleased with the display and anticipate heavy demand for it by soil conservation districts," said SCS State Conservationist Mike Nethery. "It is an excellent display for county fairs and conservation tillage meetings."

The simulator is 6 feet across, 4 feet deep, and 9 feet high. It breaks down to fit into a pickup truck and can be set up in about 45 minutes. Detailed information, including close-up slides, is available from John Laflen, Agricultural Research Service, Davidson Hall, Iowa State University, Ames, Iowa 50011.

Lynn Betts,
public affairs specialist, SCS, Des Moines, Iowa

Conservation Assistance for Three Typical Farms

As part of recent staff analysis, an economist with the U.S. Department of Agriculture's (USDA) Economic Research Service estimated the value of Government conservation assistance programs for a typical Kansas wheat farm, Wisconsin dairy farm, and Iowa corn-hog farm.

The typical Kansas wheat farm directly or indirectly benefits by $545 per year from USDA conservation programs, divided fairly equally among cost-sharing programs like the Agricultural Conservation Program (ACP), technical assistance provided by the Soil Conservation Service, and flood protection and small watershed projects. Such a farm would also receive about $150 annually in State and local public conservation expenditures.

The typical Wisconsin dairy farm benefits by $250 per year from USDA conservation programs, divided among ACP (50 percent), technical assistance (35 percent), and flood protection and small watershed projects (15 percent). State and local government conservation programs add $115 per year.

The typical Iowa corn-hog farm benefits by $210 per year from USDA conservation programs, divided among ACP (45 percent), technical assistance (35 percent), and flood protection and small watershed projects (20 percent). State and local government conservation programs add $130 per year.

Reprinted from the January/February 1986 issue of the Economic Research Service newsletter.

District Provides No-Till Equipment and Rebates

Money isn't everything. By offering rebates to farmers for trying no-till, a conservation district in eastern Pennsylvania has found that equipment availability can be as important as financial incentives in the adoption of no-till farming.

Concerned about soil erosion on farmland, the Monroe County Conservation District established a rebate program in the spring of 1983 to encourage local farmers to apply no-till. The district set aside $1,500 to help defray costs for farmers applying no-till for the first time. These funds were offered in the form of rebates of $6 an acre.

Farmers in the county can contract for no-till planting for about $10 an acre. Four no-till corn planters were available during 1983, but there were no small-grain/hay drills in the county. As a result, all of the new no-till acreage was in corn. The district paid out more than $400 in rebates.

In an evaluation of the program's first year, the Monroe County Development Committee, a group of representatives from different sectors of the county and from agricultural agencies, concluded that the limiting factor for taking advantage of the program appeared to be equipment availability. "The bottom line for increasing no-till," the committee wrote, "is to have equipment available for use."

More equipment was on the way. A survey of local farmers during the winter of 1984 indicated that several more no-till corn planters—but still no small-grain/hay planter—would be available for spring use. The district then decided that some of its 1984 funds for the rebate program should be used to obtain a no-till small-grain/hay seeder. It also entered into an agreement with the Soil Conservation Service to share the services and salary costs of a technician to help promote no-till and install other practices.

The rebates were taken off corn but continued for small grain and hay. "Farmers have been using no-till on corn for 15 years or more, but we wanted to see no-till expanded to other crops," said E. Elmer Kreger, district chairman.

By late spring of 1984, the district had leased a small-grain/hay seeder. It charged farmers $10 an acre for seeding but returned $6 an acre to them if they qualified for the rebate program.

"We planted 35 acres of oats on four farms and 49 acres of hay on six farms," said Al Weichman, district manager. "This is a good record for the year considering a late start in the season."

The district eventually purchased the small-grain/hay seeder, and the practice of no-till continues to increase in the county. During 1985, farmers were paid rebates for planting 250 acres of no-till oats, soybeans, rye, buckwheat, and sorghum. For the 1986 season, the district plans to hire a full-time technician.

To qualify for the rebates, a farmer must agree to become a district cooperator, implement a conservation plan, apply lime and fertilizer according to a soil test, and have herbicides and pesticides applied by a certified applicator. Application forms are available at the district office and local offices of SCS, Cooperative Extension Service, and Agricultural Stabilization and Conservation Service.

Fred Suffian,
district conservationist, SCS, Sciota, Pa.

Wetland Symposium To Be Held

An International Symposium on Ecology and Management of Wetlands will be held June 16-20 in Charleston, S.C. The symposium is being sponsored by several Federal and State agencies, private industry, and professional organizations.

The symposium will explore the ecology and management of wetlands of the world: their inhabitants, their uses, their similarities, and their differences. Objectives include:

- To bring together leading international scientists to define the state-of-the-art on specific topics concerning the ecology and management of wetlands;
- To discuss recent research findings and future research needs; and
- To expose graduate students and young researchers to new techniques, established scientists, and a holistic outlook on wetland problems and opportunities.

The program will consist of invited papers, contributed poster sessions, panel discussions, exhibits, field trips, and pre- and post-symposium tours.

For more information, contact Donal D. Hook, Chairman, c/o Department of Forestry, Southeastern Forest Experiment Station, 2730 Savannah Highway, Charleston, S.C. 29407.

State Floodplain Managers To Hold Conference

A conference on flood management, Backwaters '86: Strengthening Local Flood Protection Programs, will be held June 17-19, 1986, in Pittsburgh, Pa.

Presentations will be made by principal U.S. and Canadian agencies involved in flood management, including Environment Canada, U.S. Army Corps of Engineers, USDA's Soil Conservation Service, Federal Emergency Management Agency, National Weather Service, and U.S. Geological Survey.

City managers and mayors will discuss the pros and cons of present management programs. Seven special courses, intended to bring flood managers up to date on selected topics, will be offered each of the first two afternoons.

The conference will include a field trip to the sites of the Johnstown, Pa., floods, a large vendor and nonprofit organization display area, and a publications exhibit.

For more information, contact Allan N. Williams, Association of State Floodplain Managers Program Chairman, DEP/ Natural Resources Center, 165 Capitol Avenue, Room 553, Hartford, Conn. 06106.

Conservation Highlights

Summary of Activities
of the Soil Conservation Service
for Fiscal Year 1985

In 1985, the U.S. Department of Agriculture's (USDA) Soil Conservation Service continued to concentrate on reducing excessive soil erosion on crop, range, pasture, and forest lands; conserving water used in agriculture; and reducing upstream flood damages.

Working through the Nation's nearly 3,000 soil conservation districts, SCS provided technical assistance to farmers and ranchers in applying conservation practices and systems that reduced soil losses in 1985 by 230.5 million tons. SCS also helped farmers to conserve 960,000 acre-feet of irrigation water.

In 1985, SCS completed work on 18 watershed projects—all with flood prevention as their main purpose. The completed projects are reducing flood hazards on 847,000 acres.

SCS helped landowners and land users achieve these savings in soil and water and protection from floods through close cooperation with other USDA, Federal, State, and local agencies.

Conservation Tillage
Farmers' use of all forms of conservation tillage continued to grow in 1985. According to the National Association of Conservation Districts' Conservation Tillage Information Center, of the 316.9 million acres planted to crops in 1985, farmers used some form of conservation tillage on 99.6 million acres, nearly a third. Conservation tillage is any tillage or planting system that retains at least 30-percent residue cover on the soil surface. More than 60 percent of the acres under conservation tillage are in the Corn Belt and Northern Plains States. Farmers are making the most increases in their use of conservation tillage methods on full-season corn and soybeans. Farmers used no-till, a conservation tillage method in which only a narrow seedbed is disturbed for planting, on 14.9 million acres.

Targeting
SCS, the Agricultural Stabilization and Conservation Service (ASCS), and other USDA agencies continued to target funds and technical assistance to the most serious natural resource problems in parts of 44 States and Puerto Rico. Erosion reductions on 5.8 million treated acres averaged 7.4 tons per acre. Irrigation water conserved totaled 150,000 acre-feet on 289,000 acres treated in targeted areas.

Agricultural Conservation Program
Through the Agricultural Conservation Program (ACP), SCS provided technical assistance to about 100,000 farmers and ranchers who installed conservation practices on their land. Under long-term agreements, SCS assisted 9,000 farmers, including low-income farmers, who installed enduring conservation practices such as terraces and grassed waterways. Through ACP, farmers and ranchers installed water conservation practices benefiting 598,000 acres, installed terrace systems benefiting 390,000 acres, and applied conservation tillage benefiting 1.9 million acres. ASCS administers ACP and provides financial assistance to landowners.

Great Plains Conservation Program
In the 10 Great Plains States, 943 farmers and ranchers signed long-term contracts to apply conservation measures on 2.1 million acres. Farmers completed 1,082 contracts on 2.8 million acres. Through GPCP, SCS provides technical assistance and cost sharing to landowners to minimize the hazards of recurring drought and wind and water erosion.

Rural Abandoned Mine Program
SCS administers the Rural Abandoned Mine Program (RAMP), authorized by Section 406 of the Surface Mining Control and Reclamation Act. Through RAMP, SCS provides technical and financial assistance to land users in reclaiming soil and water resources on rural lands adversely affected by past coal mining. By the close of fiscal year 1985, 498 contracts obligating $50.4 million had been signed. Conservation work done under these contracts reduced soil erosion by 532,725 tons, eliminated 820 safety and health hazards, and improved water quality in 54,587 acres of lakes and 243 miles of streams.

Soil Erosion Research
SCS continued to support research on how specific properties of eroding soils relate to losses in crop yields in all parts of the country. SCS cooperated with the Agricultural Research Service (ARS) on replacing the Universal Soil Loss Equation and Wind Erosion Equation with more up-to-date models which will be useful on a landscape and watershed scale. SCS also cooperated with ARS in evaluating soil losses from ephemeral gullies. SCS, ARS, and State universities cooperated on special soil erosion research projects in Idaho, Iowa, New Mexico, New York, North Carolina, and the Palouse area in the Northwest. Resources for the Future, a private, nonprofit conservation organization, was awarded a contract by SCS to evaluate the offsite effects of soil erosion.

Soil Moisture and Temperature Monitoring
This was the sixth year in an 8-year study that SCS monitored eight soil moisture measurement sites in the United States. Monitoring was scaled down to take readings only on the grassed sites assuming that cropped sites could be estimated from this information and the use of models. ARS is using the data to calibrate a soil moisture model which will be useful in irrigation scheduling, dryland farming, soil classification, and crop forecasting. SCS completed testing of the prototype mobile nuclear magnetic resonance soil moisture instrument.

Soil Surveys
In fiscal year 1985, 74 soil surveys were published and 75 survey manuscripts with maps were sent to be printed. SCS mapped more than 40.2 million acres during the year. An additional 5.4 million acres were mapped by cooperating agencies. Each soil survey describes the physical and chemical characteristics of the soils in the survey area—generally a county. It names and classifies the soils according to a nationwide system and provides information on the potentials and limitations of the soils for various uses. Detailed maps show where each soil is located.

Colorado River Salinity Control Program

In the Arizona Wellton–Mohawk salinity control project, SCS has assisted irrigators to develop 376 salinity control-water management plans for treating 48,588 acres. Average onfarm irrigation efficiencies have been raised from 55 percent to 80 percent, substantially reducing saline return flows to the Colorado River. The U.S. Department of the Interior's Bureau of Reclamation provides financial assistance.

Projects in the Uinta Basin, Utah, and Grand Valley, Colo., have reduced the total annual salt load to the Colorado River by about 50,700 tons. SCS provides technical assistance on these projects and USDA's Agricultural Stabilization and Conservation Service provides cost-sharing funds. Also cooperating are the Extension Service, ARS, and the Bureau of Reclamation.

In 1984, Congress enacted Public Law 98–569 to amend the Colorado River Basin Salinity Control Act of 1974 and authorize the Secretary of Agriculture to operate a voluntary onfarm salinity control program for the Colorado River Basin. The delegation of authority for administering the new program has been developed and draft rules and regulations formulated.

Small Watershed Projects

SCS began construction on 14 new Public Law 83–566 small watershed projects in 1985, approved planning for 43 projects, authorized installation of 34 projects, and completed construction on or closed out 18 projects. Small watershed projects combine conservation measures and structural and nonstructural measures to reduce flood damage and provide agricultural water management, municipal and industrial water, recreation, and wildlife habitat.

Emergency Assistance

Under Section 403 of the Agricultural Credit Act of 1978, SCS funded approximately $16.1 million worth of emergency watershed protection work during the year to help States repair damage caused by floods and other natural disasters.

Emergency Jobs Act

Funds made available under the 1983 Emergency Jobs Act (Public Law 98–8) enabled SCS to fund additional watershed, flood prevention, emergency watershed protection, and resource conservation and development measures. SCS obligated $11 million in fiscal year 1985, completing work authorized in high unemployment areas in 41 States.

Resource Conservation and Development Areas

In fiscal year 1985, work continued in the 194 areas authorized for assistance under the Resource Conservation and Development (RC&D) program. SCS provides USDA leadership for these locally initiated, sponsored, and directed areas designed to conserve natural resources, accelerate economic development, and reduce unemployment where needed to stimulate the local economy. RC&D measures completed in 1985 numbered 1,103. RC&D financial assistance was provided on 187 of these measures.

River Basin Studies

SCS leads USDA cooperation with other Federal, State, and local agencies in making investigations and surveys of river basins to guide the development of water and related land resources in agricultural, rural, and upstream watersheds. In 1985, 69 river basin studies were in progress in 47 States and 12 were completed.

Flood Plain Management

Under Section 6 of Public Law 83–566, SCS completed 34 flood plain management studies and 7 reimbursable flood insurance studies in 1985. The studies include data on natural and beneficial values of flood plains and on management alternatives. Local units of government use this information to develop, adopt, implement, and amend flood plain management programs.

Resource Inventories

The fieldwork for the 1982 National Resources Inventory (NRI) was completed in 1982, and the final NRI data were released in 1984. In 1985, SCS worked on a statistical bulletin summarizing the 1982 NRI data, which include information on soil, water, vegetation, and related resources.

Important Farmland Inventory

As authorized by Section 302 of the Rural Development Act of 1972, SCS leads USDA efforts for inventorying the Nation's important agricultural areas. By the end of fiscal year 1985, SCS had published important farmland maps—which delineate prime, unique, and other important farmlands—for about 930 counties. Another 350 maps are nearly completed. Statewide prime farmland maps have been completed for 18 States.

Cartography and Geographic Information Systems

The SCS National Cartographic Center reproduced 50,000 conservation plan maps for land users and 1,300 base and thematic maps. The center contracted for the photographic reproduction of 45,500 maps and printing of maps for 100 new soil surveys. The center also provided States with new maps for 123 soil survey areas. Significant mapping support was provided in developing a series of drainage area maps for the Great Lakes and Chesapeake Bay. The cartographic center also assisted with developing a general soil map for the Kingdom of Saudi Arabia.

Rural Development

Through State and local Food and Agriculture Councils, SCS cooperated with many others to improve program delivery in rural development. In fiscal year 1985, SCS assisted more than 29,000 units of government in rural communities to control flooding, reduce roadside erosion, improve the landscape, and preserve historical and cultural resources. Many private citizens volunteered their time and talents to these activities to gain for their communities rural, municipal, and industrial water supplies; irrigation water; and recreation areas.

Volunteers

Close to 600 volunteers, of all ages, donated 50,000 hours in 1985 to help SCS

with soil and water conservation. Their time, most of it spent in field tasks, is valued at almost half a million dollars. SCS is seeking more volunteers.

Engineering
In 1985, SCS worked on developing technical guides to help farmers improve the water conservation benefits of surge irrigation. The data base for the national inventory of SCS-assisted dams became fully operational. A team of SCS and ARS employees developed an interactive computer program of SCS Technical Release 55, "Urban Hydrology for Watersheds." The program can be used in determining the effects of conservation practices on flood reduction in rural and urban areas. SCS developed three training modules for field staffs on the Unified, American Association of State Highway and Transportation Officials, and USDA textural soil classification systems. SCS revised its National Engineering Handbook, Section 19, to include the latest procedures for inspecting and testing construction materials. SCS also issued revised Technical Release 60, "Earth Dams and Reservoirs," to reflect changes in hydrology, peak breach discharge, and slope stability criteria.

Water Quality
SCS continued efforts to integrate the improvement of water quality into its programs. Activities included cosponsoring the National Nonpoint Source Conference in Kansas City, Mo., and the North American Lake Management International Meeting at Lake Geneva, Wis.; serving on the nonpoint source subcommittee of the International Joint Commission's Water Quality Board; assisting States in the development of the U.S. task force phosphorus reduction plans for Lakes Erie and Ontario; and assigning a full-time liaison to the U.S. Department of the Interior's Bureau of Reclamation office in Denver, Colo., to coordinate salinity control for the Colorado River.

In responding to the Chesapeake Bay clean-up effort, SCS provided $30 million in assistance to Maryland, Pennsylvania and Virginia. In addition to the direct assistance for new State nonpoint source programs, SCS has developed a training program for conservation district supervisors and has trained SCS and State personnel on water quality issues. SCS cosponsored a special issue of the Soil Conservation Society of America's journal on nonpoint source pollution and jointly funded development of a documentary on nonpoint source pollution through the Nebraska public television system.

Rural Clean Water Program
The Rural Clean Water Program (RCWP) was created by Public Law 96–108 in 1980 as an experiment to evaluate the effectiveness of conservation practices in solving nonpoint source water quality problems. To date 1,838 individuals have signed contracts totaling $28 million in the 20 RCWP projects. When completed, the conservation practices in these contracts will adequately treat 337,033 acres. The signed contracts have used 81 percent of the available RCWP cost-share assistance for treatment on 63 percent of estimated critical areas.

Conservation Education
SCS and the General Federation of Women's Clubs are cooperating on a multi-year program, "The World at Your Feet." Since 1984, thousands of club women have been involved in local soil and water conservation activities. SCS assisted the National Wildlife Federation through its National Wildlife Week to reach more than 100 million people over 2 years with the message "Soil—We Can't Grow Without It."

Snow Surveys
Through its Snow Telemetry System (SNOTEL), SCS collected snowpack information at more than 500 automatic data collection sites in the Western United States. SCS also issued more than 3,500 water supply forecasts used by municipal water authorities, irrigation companies, and individuals. With funds from the National Weather Service, the SNOTEL system in the Colorado River Basin is being expanded by 37 sites to enable forecasters to predict runoff more accurately.

Range
SCS continued to promote the proper management of rangeland vegetation to protect soil and water resources while improving the efficiency of lifestock production. With a number of other organizations, SCS cosponsored the National Conference on Range in November 1985. The conference drew 600 participants to explore opportunities for conserving and improving range. A new training agreement enables SCS to assign certain employees to work on a conservation district cooperator's farm or ranch to gain hands-on experience in farm or ranch operations.

Windbreaks
SCS assisted with planting an estimated 2,000 miles of field windbreaks in 1985 to protect cropland from wind erosion and provide wildlife habitat. The agency also assisted landowners with planting farmstead and feedlot windbreaks to save energy.

Fish and Wildlife
SCS continued to provide technical assistance to land users to maintain and improve wildlife and fish habitat on private land. This assistance led to improved management of 1.8 million acres of upland habitat and 300,000 acres of wetland habitat, benefiting a wide variety of wildlife species.

Plant Materials
SCS plant materials centers cooperatively released seven conservation plants in 1985. These plants are intended for a variety of conservation uses ranging from controlling critical soil erosion in orchards in Hawaii to providing improved protection and forage quality on rangeland in the Southwest. Commercial production available for use in 1985 of all SCS conservation releases totaled 5.5 million pounds of seed and 11.4 million plants, enough to treat 1.2 million acres of land. This was worth $19.4 million on the retail market.

Cultural Resources Activities

Among the significant cultural resources discovered and protected during SCS activities this year are a 12th century Mississippian Indian mound complex in Tennessee and an early farm site in Hawaii. While the level of protection for cultural resources has increased, SCS expenditures for contracted cultural resources studies have decreased by 84 percent over the last 5 years. The savings can be attributed to more and better training of field personnel, streamlined procedures, and critical evaluations of contractors' reports and recommendations.

Sociology

A study of early adopters of no-till in the Palouse area of Washington and Idaho was completed by researchers at the University of Idaho and Washington State University. An SCS National Headquarters team was established to improve the distribution of sociological information on the adoption of conservation practices to SCS personnel in the field. SCS completed two training modules for field employees: "Applying Social Data to Conservation Planning and Application," and "Collecting and Analyzing Social Information." In 1985, SCS cosponsored a symposium entitled: "Implications of Social and Economic Research for Policy Development and Program Implementation." An executive summary has been published by the Soil Conservation Society of America.

Information Resources Management

SCS and Farmers Home Administration (FmHA) developed a joint procurement contract for purchasing microcomputer office automation equipment. The contract was awarded in September 1985 and will cover several years. The company chosen will provide computer services—both hardware and software—to 3,300 SCS offices and 2,500 FmHA offices. Field Office Communications and Automation System (FOCAS) equipment will enable SCS to improve lines of communication with other Federal, State, and local governments and improve service to land users.

Reform '88

SCS Reform '88 initiatives have led to improved quality and timeliness in performing administrative functions and implementing conservation programs. The quality of the services SCS delivers will continue to increase with the growth of FOCAS, cooperative processing, automated systems, and paperwork reduction.

International Activities

SCS shares its technical expertise in soil and water conservation, natural resource surveys, and rural community protection and development with other countries. In fiscal year 1985, 165 specialists traveled to 42 countries to provide technical assistance requested by the Agency for International Development (AID), international organizations, and individual nations. Participation included representation at soil and water resource related international forums in addition to long- and short-term technical assistance activities. Short-term assignments included scientific and technical exchanges as well as assignments under the Soil Management Support Services, an AID project implemented by SCS to provide technical assistance in soil survey, soil classification, and use and management of soils to developing countries. Also, 253 officials, scientists, and technicians from 49 countries observed conservation practices in the United States.

Resources Conservation Act Appraisal

The second appraisal of the soil, water, and related resources of the Nation required by the Soil and Water Resources Conservation Act of 1977 is underway. It is focusing on a comparison of the 1977 and 1982 National Resources Inventory, the highest soil and water conservation priorities in the National Conservation Program, and resource concerns identified by the public and interest groups. The appraisal is scheduled for completion in March 1987.

Economics

To improve SCS technical assistance to landowners and users, more than 175 SCS field employees received training in the use of economic principles and methodologies in conservation planning. A microcomputer program was developed for field staffs to use in evaluating the benefits and costs of alternative conservation practices for controlling sheet and rill erosion.

Summary of Accomplishments Fiscal Year 1985

Accomplishments in soil and water conservation programs assisted by the Soil Conservation Service.

Progress Item		Fiscal Year 1985
Long-term Contracts		
Contracts completed or terminated		
GPCP	No.	1,179
	acres	3,054,899
RAMP	No.	14
	acres	191
Watershed protection and flood prevention	No.	125
	acres	18,050
Contracts signed		
GPCP	No.	943
	acres	2,144,880
RAMP	No.	76
	acres	822
Watershed protection and flood prevention	No.	737
	acres	97,180
Unserviced applications		
GPCP	No.	1,521
RAMP	No.	1,325
Watershed protection and flood prevention	No.	1,119
	acres	218,151
Resource Conservation and Development Areas		
RC&D measures completed	No.	1,103
Conservation Plans and Related Services		
New district cooperators	No.	2,913
	acres	7,599,026
Individuals, groups, and units of government assisted	No.	942,681
Individuals and groups applying practices	No.	411,830
Conservation plans	acres	10,605,343
Soil Surveys		
Soil surveys	acres	45,556,087

CONSERVATION Research Roundup

Scientists Measure Iron Oxide to Estimate Soil Age

Hoping to determine the rate of soil formation compared to erosion, scientists at the University of California, Davis, are comparing iron oxide content in soils of various ages.

Graduate student Jacob R. Aniku and Professor Michael J. Singer, both of the department of land, air, and water resources, have been studying methods for determining soil age using characteristics which can be observed and quantified.

Iron oxide is one such characteristic which can be monitored and may be useful to detect soil age. As soils age and the parent material weathers, iron oxides gradually build up. If scientists find the amount of iron oxide in soils of known age, they can then compare the amount of iron oxide in soils of unknown age and estimate how old they are.

Aniku and Singer applied this technique to four marine terrace soils on the Pacific Coast near Santa Cruz, Calif. The ages of these soils are known.

By monitoring the accumulation of iron oxides in the soil and by noting other changes in soil properties, researchers can estimate the relative age of sediments. These techniques help scientists determine how fast soil is forming, and in turn, whether it is in danger of eroding faster than it forms. This method is important to basic soils studies and may provide information to explain soil properties of significance to agriculture or environmental pollution.

Tillage Practice Affects Nitrogen Loss in Soil

Farmers who switch to conservation tillage may affect soil fertility and nitrogen loss in the process, says Gary Malzer, soil scientist with the University of Minnesota's Agricultural Experiment Station.

According to Malzer, the recent shift by farmers to conservation tillage in order to reduce energy, labor, and machinery costs as well as soil erosion is causing a reexamination of nitrogen management. He says the amount of surface residue affects the fertility, water, temperature, aeration, and biological activity of the soil. In the case of conservation tillage, increased crop residue acts like a mulch, keeping soil wetter, colder, and, as a consequence, less biologically active.

To learn more about the relationship between tillage practice and soil fertility, Malzer examined the rate of nitrogen transformation (nitrogen transforms naturally from ammonium to nitrate, a form more readily lost from soil) on continuous corn grown under four tillage practices—moldboard plow, chisel plow, ridge-till, and no-till. He conducted the tests on a Hubbard loamy sand and on a Mt. Carrol silt loam. Anhydrous ammonia was applied to the test plots, both with and without nitrapyrin, a chemical that inhibits the microbes that transform ammonium to nitrate.

Under all tillage treatments with both soil types, nitrapyrin reduced the rate of nitrogen transformation. Under the moldboard plow treatment without nitrapyrin, 84 percent of the ammonium within the area sampled was transformed by the sixth week; with nitrapyrin, only 45 percent of the ammonium was transformed.

Malzer also found dramatic yield increases, as much as 50 bushels per acre, when nitrapyrin was applied at the loamy sand site on no-till and moldboard plow treatments. Smaller yield increases, about 20 bushels per acre, were observed on the ridge-till and chisel-plow systems. There was little affect on yield when nitrapyrin was applied on the silt loam site.

Malzer says this research could eventually lead to different fertilizer recommendations for different tillage systems.

Long-Term No-Till May Improve Soil Structure

Many farmers are cultivating their fields using tillage systems that may not be the best suited for the physical properties of the soil, according to research agronomists at Purdue University, West Lafayette, Ind.

By measuring the air flow through core samples of soil, the researchers found that long-term no-till may lead to improved soil structure and continuity of air flow through pores on poorly structured soils. Air flow rates are important in the soil because they can affect rates of root growth.

John R. Heard, former graduate student at Purdue and currently a soil and crops specialist with the Ministry of Agriculture and Food in Stratford, Ontario, Canada, conducted the research along with Eileen J. Kladivko, Purdue assistant professor of agronomy.

For the study, Heard and Kladivko took soil samples at three depths: 6, 10, and 14 inches. The samples were taken in the rows and in the nontrafficked interrows of plow, chisel, ridge till-plant, and no-till plots. The plots contained continuous soybeans or a soybean and corn rotation.

Air flow through the core samples was measured under a low constant air pressure.

The air permeability in tilled treatments of well-structured Chalmers soil was reduced "between the rows" in comparison with the rows. This result was probably due to interrow cultivation, the researchers said.

In the deeper depths of the Chalmers soil, no-till plots had better air flow than tilled plots. A higher amount of biological activity and a lack of pore destruction by tillage probably caused no-till plots to have better air flow.

In poorly structured Clermont soil with low organic matter, ridge-till had the greatest air permeability of all tillage treatments at the 6-inch depth. No-till and ridge-till had better air flow than chisel or plow from 8 to 16 inches deep.

Long-term no-till practices may lead to improved soil structure and continuity of pores on poorly structured soils.

New Publications

Soil Erosion and Crop Productivity

Edited by R. F. Follett
and B. A. Stewart

The American Society of Agronomy (ASA), Crop Science Society of America (CSSA), and Soil Science Society of America (SSSA) held a symposium to bring together soil scientists, economists, sociologists, historians, and other specialists to discuss their research findings on the impacts of soil erosion on crop productivity. Soil erosion caused by flooding, unrelenting rains, or high winds can devastate a farm in a short time; it can destroy a productive field in just a few generations.

The subject of soil erosion is a highly controversial one—some believing it is only a minor problem; others stating that it is a most serious worldwide concern. Some of the issues discussed are: the decreasing crop productivity on farmlands; philosophical, socioeconomic, and institutional causes of excessive erosion; the methodology of measuring the impact of soil erosion on crop productivity; current technological and institutional advances for erosion control and productivity maintenance by physiographic regions of the United States; and the strategy for influencing policy and institutional decisions regarding the impacts of soil erosion to protect the long-range interests of the public in land productivity.

Copies of this 533-page text are available for $36 from ASA, CSSA, and SSSA, Book Order Department, 677 South Segoe Road, Madison, Wis. 53711.

Grass and Legume Seed Production in Montana and Wyoming

by Larry K. Holzworth
and Loren E. Wiesner

This publication provides general guidelines for seed production in Montana and Wyoming and some detailed guidelines for selected species. It contains information on selecting a site, preparing the seedbed, planting the grass or legume, controlling weeds, and irrigating and fertilizing the crop to produce certified seed. Certified seed is needed by land users who must treat conservation problems on their land.

The information in this publication should be of interest to seedgrowers in producing certified seed of conservation plants as well as to Federal, State, and other cooperating agencies.

Single copies of *Grass and Legume Seed Production in Montana and Wyoming* are available from the Extension Mailing Room, Pryor Hall, Montana State University, Bozeman, Mont. 59717.

Principles and Applications of Hydrochemistry

by Erik Eriksson

The author defines hydrochemistry as "the subject area of transformation and transportation of substances, together with the circulation of water in the continental areas of the globe, on a time scale up to a few thousand years."

After an introductory chapter comes a chapter on elementary chemical principles of particular use in hydrochemistry. Other chapters include information on the various hydrochemical processes following the flow path of water from the atmosphere to the soil surface and into the domains of soils and minerals to ground water discharge areas, where water appears on the surface in lakes and water courses; possible hydrochemical models; and environmental isotopes and their role as carriers of information on hydrological systems; and finally the applications of hydrochemistry.

Many illustrations are used throughout this 187-page text.

Copies are available for $39.95 from Methuen, Inc., 29 West 35th Street, New York, N.Y. 10001.

National Range Conference Proceedings

The U.S. Department of Agriculture along with 60 other sponsors, held a conference in November 1985 to call attention to opportunities for improving the management and productivity of rangelands. The conference brought together ranchers, research scientists, environmentalists, educators, private business people, and government officials to discuss the many environmental and economic choices facing rangeland managers today.

Some recurring messages were heard throughout the conference, such as: there must be cooperation between landowners and government officials; range managers must keep attuned to the needs and changes in the range ecosystem and adapt their management accordingly; use of rangeland will become more diversified in the future; strengthened research programs are needed; and tax policies, international trade, and other factors influence the use and condition of range.

The papers presented here are by experts in their fields.

For copies of this 158-page publication, contact Douglas Sellars, c/o National Rangeland Conference, P.O. Box 2890, Washington, DC 20013-2890.

Soil Salinity Under Irrigation: Processes and Management

Edited by I. Shainberg
and J. Shalhevet

This book was prepared as background for an international symposium held in Bet Dagan, Israel, in March 1984. It is based on the papers presented and summarizes the findings.

The subject matter of soil salinity under irrigation is divided into two broad aspects. The first, processes, covers the basic chemical reactions taking place in saline and sodic soils and their effect on soil physical properties, the dynamics of salt transport in the soil and its accumulation to detrimental levels, and the methodology of monitoring soil salinity and evaluating water quality.

For the second aspect, management, basic principles are used to describe and evaluate the technologies of leaching, drainage, and reclamation on a field scale, taking into account spatial variability.

Crop production is discussed with respect to the various management practices used in irrigation agriculture.

Many graphs and tables are used throughout to further illustrate the information in the text.

Copies of this 349-page book are available for $52 from Springer-Verlag New York, Inc., 44 Hartz Way, Secaucus, N.J. 07094-2491.

Recent Soil Surveys

Published by the Soil Conservation Service

Massachusetts: Worcester County.
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Missouri: Stoddard County.
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